IUE OBSERVATIONS OF THE SOCKET STAR MT Ori AND ITS CIRCUMSTELLAR ENVIRONMENT

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Abstract. We have obtained a series of large aperture images taken at different spatial locations relative to MT Ori which form a "cross-cut" of about 50″ in length through the star and its immediate environment. The data show a marked drop in nebular continuum emission and 1909Å line emission, centered on MT Ori, which is consistent with the appearance of MT Ori on high-quality optical plates as being embedded in a region of low H-alpha brightness, which may be physically associated with MT Ori.

Key words: socket stars-circumstellar material-pre-main sequence stars.

1. Introduction

Socket stars are stars which appear on high-quality plates of HII regions to be embedded in dark regions 5″ to 20″ in radius, approximately centered on the star, called "sockets" (Glushkov 1952, 1986, 1991; Feibelman 1989). Feibelman (1989) reports that "dozens" of sockets are visible in Orion and other HII regions. Although some are likely to be chance superpositions of stars against physically unrelated dark background regions, Feibelman (1989) argues that overall socket stars occur more frequently than can be accounted for by chance superpositions. Almost all Orion socket stars show an IR excess (Castelaz 1990), although this is common for non-socket stars in the Orion region. It is reasonable to suspect that the dark sockets represent a circumstellar envelope of some sort, possibly the remnant of the "cocoon" in which the star was formed. In an effort to obtain more information as to the physical nature of the sockets, we undertook IUE observations of one socket star in Orion.

2. Program and Results

We obtained a series of large aperture SWP images of the MT Ori vicinity. Each image was taken with the telescope pointed in a slightly different direction, so that the images overlapped along the short axis of the large aperture (10″ × 20″ oval). The sequence of images forms a cross-cut in the NW to SE direction. A few images were also taken NE of MT Ori. Because MT Ori is 10th magnitude, and has spectral type F with an E(B-V) = 2.0 (Glushkov, 1993, private communication), the detected flux in our spectra (which are short exposures) must be from nebular

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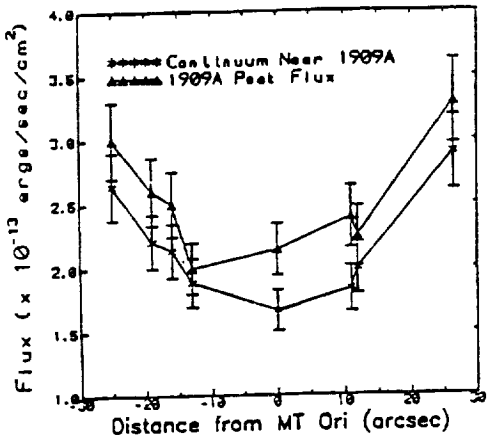

Fig. 1. Observed continuum and 1909Å CIII] line flux changes in SE (left) to NW (right) direction across MT Ori. Continuum bins were 50Å wide.

emission rather than MT Ori. We note that MT Ori is thought to be a pre-main sequence star on the basis of its X-ray emission (Vaiana et al. 1981).

Despite the limited spatial resolution imposed by the dimensions of the large aperture, we find a clear local minimum in nebular emission which appears to be centered on MT Ori (Fig. 1). This area of diminished emission has a radius of about 20″. We do not know the UV emission SW of MT Ori, but the available fluxes do possess spatial symmetry on three sides of MT Ori, suggesting a "socket" in the UV. Although the data do not rule out the possibility that this is the result of a chance superposition of MT Ori against a relatively faint area of the nebula which is physically unrelated to the star, the fact that the UV emission reaches its minimum coincident with the position of MT Ori and the fact that the flux changes monotonically on either side suggests that the star is physically related to the local nebular minimum.

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